DOCUMENT RESUME

ED 233 951 SO 014 961

AUTHOR Johnston, Barry V.
TITLE The Politics of Scarcity: A Consideration of Futurist Models of Boom and Doom.
PUB DATE Mar 83
NOTE 28p.; Paper presented at the Annual Meeting of the Southwestern Social Science Association (Houston, TX, March 16-19, 1983).
PUB TYPE Information Analyses (070) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Developed Nations; Developing Nations; *Energy; *Food; *Futures (of Society); *Natural Resources; *Overpopulation; *Prediction
IDENTIFIERS Godwin (William); Interdependence; Malthus (Thomas Robert); Marxian Analysis; Scarcity

ABSTRACT

The works of 20 futurists and their predictions for the year 2000 and beyond are examined according to four perspectives: Malthusianism, Utopianism (based on theories of William Godwin), Marxism, and social structuralism. Futurists may be grouped into one of the categories according to their theories about the interdependent problems of population, food, natural resources, and energy. Malthusians suggest that the population size should be reduced, argue that we have already depleted easily exploitable natural resources, and believe that nuclear energy will provide the energy base of the future. Utopians advocate moving more land into production through intensive agricultural techniques, accept the idea that sufficient supplies of basic minerals exist, and argue that supplies of conventional energy sources are adequate for a long range transition if change is required. Marxists attribute food crises to maldistribution and overconsumption of resources, argue that less developed countries are deprived of their own natural resources through the consumption of developed nations, and acknowledge that politics influences cost and supply much more than the issue of finite resources. Social structuralists argue that not only population growth but also its distribution exacerbates food shortages. They also argue that simpler life styles are less resource intensive and more conducive to use of soft energy paths, such as solar, wind, and biomass energy. Appendices provide charts which depict the positions of various authors on these issues. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED233951

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Barry V. Johnston

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

THE POLITICS OF SCARCITY: A CONSIDERATION OF FUTURIST MODELS OF BOOM AND DOOM

by

BARRY V. JOHNSTON
INDIANA UNIVERSITY NORTHWEST

presented at

The Annual Meeting of The Southwestern Social Science Association
Houston, Texas

March 16-19, 1983

SP 015 961

INTRODUCTION

Many demographers and ecologist believe that todays world is beset by a series of unique problems related to the growth of human population and resource scarcity. These impressions have been reenforced by global food shortages, the oil crises, a world wide inflation, increasing problems of mineral/metal shortages and pollution. Indeed even a U.S. presidential commission concluded their report to the chief executive by noting

> "Unless nations collectively and individually take bold and imaginative steps toward improved social and economic conditions, reduced fertility, better management of resources, and protection of the environment, the world must expect a troubled entry into the twenty-first century." (G.O. Barney: 1980).

Rather than describe the interrelated crises of population, food, resources and pollution this paper instead will focus on various perspectives that emerge from the work of Futurist and shape their prognostication on the conditions for life in the twenty-first century. It is my contention that these perspectives can be grouped under four headings: Malthusianism, Utopianism, Marxism and Social Structuralism. This typology will be used to examine the works of twenty futurist and their predictions for the year 2000 and beyond.

The Malthusian position is probably the one most familiar to us. The argument is based on the notion that human population has the potential to increase at a rate much faster than can be accomodated by growth in the means of subsistence. This "dismal equation" suggest that through time population will outrun the capacity of the environment to sustain its number at a standard of living above starvation. For Malthus the solution to this dilemma is the voluntary control of population growth by use of the preventive checks. These checks are voluntary methods intended to control the size of population growth by reducing the birth rates. If these measures fail and population continues to grow, a set of natural, ecological checks will come into play that will reduce growth by increasing the death rate. These

Positive Checks are familiar as three of the four horseman of the apocalypse.. Famine, Pestilence and War.

The Utopian position is well expressed in the work of William Godwin. It was his belief that the productive capacity inherent in the technology of the Industrial Revolution was so great as to meet the future needs of expanding populations and provide a virtual paradise or utopia for mankind. Out of this school comes a belief in economic growth and technological development as a panacea for the problems of humankind. Technology will produce continuous improvement in the quality of human life. In its modern expression Neo-Godwinian scholars have argued for such extremes as migration by space travel to ease population pressures and obtaining sizeable supplies of protein foods through the synthesis of hydrocarbons. While the former may be a bit far fetched the latter is becoming a distinct possibility at this time. (Petersen: 1975; Johnston: 1979)

Marxians have a slightly different perspective on the issue of resource scarcity and the quality of life. They tend to view the current gap between the rich and the poor nations not as a result of either population size or the finite nature of resources, but as a product of the maldistribution of production and wealth. Poverty and scarcity have more to do with greed, power and over-consumption than with overpopulation and resource scarcity. It is the organization of international capitalism which reenforces the present gap between the developed and underdeveloped worlds. Consequently it is by strength and confrontation politics that the situation will be ameliorated, not by population policies and technological development. These are part of an ideology of surpression that misdirects the energies and policies of Third World nations. (Keyfitz: 1972)

The Social Structuralist view the solution to current problems of scarcity as arising from a reorganization of nation states and the relationships between states. Rather than emphasizing population control, technological development,

or wealth redistribution the structuralist argue for a reorganization of society based on sound ecological principles. This does not obviate the need for a balance between population and resources nor a reasonable development of technology, but gives primacy to new and simplier forms of social organization. For example a post-modern society that is small in scale based on sound ecological principles which rewards stewardship of resources, modesty of life style and morality of consumption (Ophuls: 1977).

DISCUSSION

The interdependent problems of food, natural resources, energy and population produce a problematic for the world as a whole. As students of the present situation we are concerned not only with adequately describing these emerging crises but also with establishing insight into the direction for prudent and effective social policies.

Table 1 contains a brief overview of the respective positions of several futurist writers on the food situation. Those who are of Neo-Malthusian persuasion see the problem as one in which the populations of certain countries and areas of the world are placing a greater demand on the food production sectors of their economy than it can effectively meet. The demands of these areas are either not sustainable at present or will become unsustainable in the near future. The suggested strategy is to reduce demand by reducing population size. (See appendix - Table 1 here.)

For the Neo-Godwinian other remedies come to mind. They advocate moving more land into production. Increasing the use of intensive agricultural techniques such as the miracle seeds of the Green Revolution, and more widespread use of fertilizers and pesticides to increase yields. For some the modernization and mechanization of global agriculture will solve the problem. Still others argue for farming the sea, developing synthetic and alternative foods and changing food habits to accomodate these. (Thomlinson: 1977)

For the Marxist these recommendations may or may not have merit depending on their technological feasibility. Regardless of the viability of these proposals they overlook an important element of the problematic; that of distributions. Food shortages result from over consumption not overpopulation. They argue that the average American consumes roughly five times more grain and as much as eight times more protein foods as members of third world countries. The average consumption of grain in the U.S. is one ton per year per person. Most of this is consumed indirectly i.e., used as fodder for animals and to make alcohol. In the third world the average Asian, Latin American, and African lives on four hundred pounds of grain per year most of which is consumed directly. Using this reasoning every American child is equal to five third world children on the basis of food consumption. The food crises is a result of maldistribution and over consumption of resources.

The social structuralist acknowledges that population size, consumption and technology all play a role in the problem. They, however, suggest that it is not only population size, but its distribution that exacerbates food shortages. The population growth of the LDCs has been accompanied by a strong trend towards increased urbanization. The influx of people into the cities combined with a production emphasis on cash crops for world markets rather than indigenous consumption are important elements of the food crisis not made explicit in the other approaches. Large, ghettozied, poor and largely unemployable urban populations create a variety of problems other than dietary for the governments of third world countries. Instead of large urban centers these populations should locate, remain or relocate in smaller towns and villages that are relatively self sustaining. This will not only reduce the problem of food, but also ease many other problems of the metropolitian centers.

On the issues of natural resources and technology Malthusians have often been regarded as poor judges of progress (Wrong, 1977). Table 2 contains an overview of several different positions on metals and minerals. (See appendix - Table 2 here). The Neo-Malthusians argue that we have already skimmed the cream of easily exploitable energy, metals and minerals. Remaining reserves are not only subject to the demands of rapidly increasing populations, but will also be more costly in energy, land devastation and pollution.

The more optimistic position of the Neo-Godwinians accepts the idea that there are sufficient supplies of most basic minerals and where supply might prove a problem alternatives are available. They argue that conservation and recycling can extend the life span of reserves so supply will not be an issue for several minerals. Where conservation and recycling are not viable one may expect new reserves to emerge as a result of discovery and alternative reclamation techniques. These strategies in tandem with the use of natural and synthetic substitutes will yield a sufficiently broad supply of natural resources for industrial development into the twenty-first century (Ophuls: 1978).

Neo-Malthusians and to some degree Marxist see several limitations in these proposed strategies. The Malthusian might well argue that only six metals are abundant in the earths crust (Iron, Aluminum, Manganese, Chromium, Magnesium, and Titanium) all the rest are geological scarce. Additionally given the present reserves of Copper, Gold, Tin, Tungsten, Mercury and Silver a new technology or metallurgy will have to be developed that can deal with the scarcity of these items. It should also be remembered that some metals do not have substitutes that can be used in current industrial forms of production (e.g., Silver, Mercury, Cobalt and Platinum). Limitations in the supplies of Lithium and Helium may also create problems for the development of breeder reactors and thermonuclear fission. Substitution and recycling are not panacea for resource scarcity, indeed they often create as many problems as they may solve (Ophuls: 1978).

The Marxist will additionally argue that developed countries are using more minerals and, as their domestic supplies decrease, they are becoming more dependent upon imports. This deprives less developed countries of the use of their own natural resources for economic development. Even though U.S. outputs and payments for minerals is expected to reach 20 billion dollars by 1985 this is not adequate compensation for the depletion of finite resources and the compromising of the futures of the poorer and lesser developed countries.

Social structuralist argue that simplier life styles are by their nature less resource intensive. Simple and smaller is more sensible and best. A society composed of smaller, more independent and labor intensive units will ease demand for finished goods and consequently the use of materials necessary for their production. However these theorist also suggest that improvement in the quality and durability of goods is essential for the effective husbandry of resources. Artifacts should be made more carefully, as simple as possible (for self maintenance) and to last. The high through-put economies of the urban industrial order must give away to durability and quality of production in the twenty-first century.

The energy positions of the futurist is presented in Table 3. On this issue social structuralist are quick to point out that the smaller, more independent and self sufficient towns and villages of a low growth society can more easily avail themselves to substitution strategies and soft energy paths. Because they recommend small scale society the techniques of solar, wind, and biomass energy are perfectly adapted to their needs. By using less of conventional energy sources these are freed for industrial and production uses and the usable life of reserves extended. (See Appendix - Table 3 here).

The Neo-Godwinians do not forsee the onset of an energy crisis as a result of limited fuel supplies. For the most part they argue that supplies of conventional

energy sources are adequate to a long range transition. Oil, coal, and natural gas are in adequate supplies and new techniques for reclamation will only deepen the reserves. When change becomes either required, necessary or desirable, promising technologies abound to meet our requirements for energy, e.g. nuclear (both fisson and fusion), synthetic fuels and bioengineering.

Many of the early Neo Malthusian writers acknowledge the relationship between a energy base and level of pollution, but they don't (with some expectation) see environmental consequences as a prime consideration. For several of those in Table 3 nuclear energy will provide the energy base of future societies. They, as well as the Marxist acknowledge that there exist a politics of energy that tends to influence supply and cost much more than the issue of finite reserves. To these futurist it seems clear that the energy problem is one of distribution. Also when current supplies do dwindle there are abundant, renewable energy technologies to be used.

Table 4 contains an overview of the various positions taken by these Futurist on the issues of population, technology, economy and social organization. As one can expect the Neo-Godwinians are among the more optimistic about the role of technology as a problem solver and the Neo-Malthusians more skeptical. The Marxist see the whole argument not as whether to grow or not grow, but how the wealth of production is to be distributed. For the Social Structuralist, technology should be scaled down to efficiently meet the more modest needs of smaller social units. Steps should also be taken to make an ecologically responsible technological use of the environment a reality. (See Appendix - Table 4 here)

The modalities of thought expressed by the Futurist for the most part, accept the notion that population growth and undifferentiated economic growth must slow down if serious problems are to be avoided. However, there is substantial disagreement over when and how this should take place.

The political element of the futurist debate is also becoming more salient. The Marxist discount the arguments of the Neo-Malthusian on the grounds that they distort the reality of our current situation and blame the victim rather than those who manipulate and profit from the situation. Some Neo-Malthusians argue that the Marxist are bound and blinded by a world view and set of political realities that necessitates a shift of blame onto a third party; the conspiracy of capitalistic nations. Other Neo-Malthusians are more sensitive to the political issues involved, but still argue that a solution must be found in programs that explicitly treat the population element, often citing China as an example.

The Neo-Godwinian commitment is to progress by way of innovation and technological change. What are crises to the Neo-Malthusians , Marxist and Social Structuralist are opportunities for the Neo-Godwinians. These crises are a set of challenges to be met. The political chaos and potential of war inherent in the perspective of the modern day disciples of Marx and Malthus are artifacts of the perspectives not unavoidable consequences of the situation. Crises of food, energy, natural resources and technology can be solved by science and technology. What is needed, is the global application of intellectual and economic capital towards resolution. The hysteria of unrestrained Malthusianism and Marxism is counterproductive to getting the job done. It misdirect our attention, energies and creativity and thus makes likely a war situation in which all will lose.

Social structuralist also argue for a solution short of confrontation and war. Specifically the reorganization of nations (developed and under developed) on holistic principles founded on informed ecological science. There are indeed limits to growth, but our current problem is one of limits of organization. A sensible reorientaions of society in the developed and less developed countries will substantially ameliorate current problems. Self sufficiency, organic growth, limited size and complexity and a revitalization of the values of community can

do much to solve problems of shortages and their related tensions. Reorganization can take place within nation states and does not require the consolidation of world powers.

OVERVIEW

As Cole (1978) and others have noted, the debate among futurist is becoming more political than scientific. Although elaborate attempts at scientific modeling have been made, poor data makes projections and internal consistency quite difficult or impossible. There is also emerging in this literature a flirtation or fetish of method that C. W. Mills has argued poorly equips us to understand and deal with problems of the social world. Perhaps the value of these works is maximized by taking an eclectic orientation towards them. There are truths to be found in each of these approaches. Population is a problem. Resources do have limits and we are beginning to reach some of them. Technology and ingenuity can transform and extend those limits. But future innovations must be implemented with an eye on their ecological impacts. Ecological principles should become part of our technological puzzles and be included in acceptable innovations and charges. New directions in social organization have promise for both the developed and the less developed countries and these should be explored as means of amelioration. There are real, serious and dehumanizing problems of distribution within and between the nations of the world and they to must be dealt with. None of the works cited above tends to restrict their total definition of the problem, current assessment of the situation, and proposed solution to only one of the perspectives discussed. While we may speak of these works as generally Malthusian or Marxist they all tend to incorporate at least a few elements of the other perspectives. This suggest that the maximum pay off in theorizing about these problems will be found in bridging the various perspectives. However, while this may deepen an objective understanding of the situation it may also dilute the political position of a particular theorist.

The entrance into the twenty-first century will be significantly shaped by how the issues of a politics of scarcity are defined and resolved. In its resolutions the issue of boom, doom or middle grounds will be decided. Perhaps from the works of Futurist a creative blending of economics, technology, organization and humanism will provide a fruitful beginning.

APPENDIX

TABLE 1

AUTHOR	POSITIONS ON FOOD AND AGRICULTURE
Kahn and Wiener	May possibly reach the limits of food technology in a couple of centuries.
Spengler	Yields could increase significantly, but something must be done about population growth.
Ehrlichs	We have nearly reached the limits of production and dont' have the surplus for growing populations.
Forrester	Physical limits soon to be reached.
Meadows	Physical and social limits force collapse of Agriculture in about a century.
Dumont	Agricultural potential limited-little reason for optimism.
Schumacher	Possible to produce enough, but given present levels of mismanagement and waste its not likely.
Heilbroner	Agriculture cannot keep up with the needs of LDC and population growth.
Mesarovic and Pestel	Some possibility for agricultural expansion in DCs - Prognosis not generally good.
Bariloche Foundation	Food scarcity is genuine and increasing, but not due to physical limits.
Kaya	Agriculture is not a satisfactory basis for continued economic development.
Leontief	Some innovations are still possible to increase agricultural output - More land etc.
Modrzhinskaya	See viable technological solutions for the food crisis.
Kosolapov	Technology and genetics will significantly increase food yields.
Tinbergen	Reaching limits - Political implications of food increase food as a political weapon.
Kahn, Brown & Martel	Technological solutions are possible.
Ophuls	Maximum sustainable population with current agricultural arrangements is 4 million people.

TABLE 1

AUTHOR	POSITIONS ON FOOD AND AGRICULTURE
Barney	The number of malnurished will increase between now and 2000. Agricultural technology and distribution system will not keep abrest to population growth.
Ridker and Cecelski	Problems of malnutrition are more related to distribution then production. Technology holds much promise for dealing with the food situation.
Brown	Food production will not keep pace with population. Decline in the quality of nutrition expected.

Sources: Sam Cole "Global Futures Debate 1965 - 1976" In Freeman and Jahoda - World Futures the Great Debate, Universe Books. N.Y. 1978. Many of the original works - see biblography for complete citations.

TABLE 2

AUTHOR	NATURAL RESOURCES: POSITIONS ON METALS AND MATERIALS
Kahn & Wiener	Reserves are adequate for future needs.
Spengler	Mineral resources are limited, exploitation depends on energy base and availability.
Ehrlichs	Resources limited, abundant energy will not help.
Forrester	Because of population growth and trade limits may be reached within a century.
Meadows	Growth will result in serious shortages in about 50 years.
Dumont	Position unclear - However limits in range.
Schumacher	No shortages imminent.
Heilbroner	Future not good - Waste and energy intensive mining are major problems.
Mesarovic and Pestel	Limited Resources.
Bariloche Foundation	Position not clear.
Kaya	Resources are adequate.
Leontief	Absolute scarcity not a problem - consumption and method of exploitation are.
Modrzhinskaya	Resources are adequate.
Kosolapov	Technology and substitution will solve any supply problems.
Tinbergen	Potential for natural resources are inexhaustable - oceans etc.
Kahn, Brown & Martel	Resources are adequate even in face of increasing demands.
Ophuls	We are reaching the limits of easy and economical natural resources.
Barney	Non fuel minerals appear sufficient to meet projected demands.
Ridker and Cecelski	Known reserves are only a small portion of the resource lose. The resources to be added by discovery, technology and substitution will prove adequate to future demands.
Brown	Growth at present rates is dangerous and limits of many resources are in sight.

Sources: Sam Cole "Global Futures Debate 1965 - 1976" In Freeman and Jahoda - World Futures the Great Debate, Universe Books. N.Y. 1978. Many of The original works - see biblography for complete citations.

TABLE 3

AUTHOR	POSITION ON ENERGY
Kahn and Wiener	Several Hundred years of cheap available energy.
Spengler	Prospects better than for minerals, but favors safe nuclear fushion.
Ehrlichs	Difficulties ahead - particularly in pollution.
Forrester	Not seperately discussed.
Meadows	Needs will be met by nuclear power.
Dumont	Nuclear power is dangerous but necessary.
Schumacher	Substitution is the solution to current difficulties.
Heilbroner	Increasing demand by LDC will intensify problem.
Mesarovic and Pestel	Nuclear is a faustian bargain - solar is a better path.
Bariloche Foundation	100 years of reserves left - nuclear is the solution.
Kaya	Demand increasing - no explicit solution.
Leontief	Shift to Coal Technology.
Modrzhinskaya	No energy problem - Nuclear fushion is inexhaustable.
Kosolapov	We are undergoing a change in energy supplies - Nuclear.
Tinbergen	Energy is main problem - development of clean sources very difficult.
Kahn, Brown & Martel	Energy will be cheaper with the passage of time.
Ophuls	We are reaching the limits of Petroleum and must start to explore for alternatives. Coal, nuclear, and soft technologies have some promise and problems. Clean and safe energy should be our goal.
Barney	There is no worry. Reserves are adequate and future needs can be met by nuclear energy.
Ridker and Cecelski	The problem with oil is not supply, but the politics of oil. Should the need arise alternative energy sources like coal, synthetic fuels or nuclear energy can fill the gap.
Brown	We are in a transition from cheap to expensive enrgy. Nuclear fuels are too problem ridden and coal to polluting to meet our needs. We need a cash program to develop renewable and clean energy sources.

Sources: Sam Cole "Global Futures Debate 1965-1976" In Freeman and Jahoda - World Futures the Great Debate, Universe Books. N.Y. 1978. Many of the original works - see biblography for complete citations.

TABLE 4

	THEORIST	POPULATION	TECHNOLOGY	ECONOMY	SOCIAL ORGANIZATION	APPROACH
(1)	Kahn-Wiener	Rapid Growth likely some hope LDCs will avoid population trap.	Some hope for a significant contribution by teohnology.	The more growth the better.	Violence likely, but social institutions should attempt to preserve freedom	Neo-Godwinian
(2)	Spengler	Our greatest problem. Control will not be automatic.	Problems are greater in LDC than technology can handle.	Use economic penalities to control population growth.	Not discussed	Neo-Malthusian
(3)	Ehrlichs	Planet already over populated - death rates will rise.	Technological optimism is founded on ignorance.	LTD growth in DC with substantial aid to LDC No panacea.	Social and Political reorganization is essential, but the time is very short.	Neo-Malthusian
(4)	Forrester	Population is a problem but not as pressing as uncontrolled economic growth, resource scarcity and pollution.	Technology creates as many problems or more than it solves.	Slower growth in rich nations along with a change toward simplier living - Growth is a problem.	Need stronger international organization.	Neo-Malthusian
(5)	Meadows	Population growth is the greatest impediment to reallocation of resources. stop population growth.	Not optimistic about technological solutions.	Industrial growth must stop.	We need a totally new form of society, but this is not an explicit solution.	Neo-Malthusian
(6)	Dumont	Must stop population growth. Four billion is already too many. Particularly the way they are distributed.	Technology is wasteful.	Need slower growth. Austerity in DCs with aid to LDCs.	Decentralization of planning in nation states. Increasing regulation by world bodies.	Neo-Malthusian
(7)	Schumacher	Population is a contributor but not a major factor in global problems.	Too large and requires too much energy and natural resources.	Laizze-Fairre economics should be replaced by humanistic economics.	Smaller, more humanistically oriented institutions.	Social Structuralist
(8)	Heilbroner	Growth will stimulate the Malthusian checks.	Abandon industrial mode of production in favor of ecologically responsible technology.	Corporate capitalism in decline - long term frugality - limited growth.	Institutions must become increasingly authortarian in order to deal with scarcity.	Neo-Malthusian

	THEORIST	POPULATION	TECHNOLOGY	ECONOMY	SOCIAL ORGANIZATION	APPROACH
(9)	Mesarovic and Pestel	Population pressure is a very significant element in global problem.	Assume technological growth will continue, but it should be regulated to be effective. The gaps between D.C. and LDC should be reduced.	Undifferentiated growth must be replaced by organic growth that is ecologically and socially responsible.	Increased global co-ordination is necessary.	Neo-Malthusian
(10)	Bariloche	Population growth is not a major factor.	Technology can outstrip population growth - Hence technology development could solve problems	Economi, growth should follow a socialist model.	National and International social political reform is essential	Neo-Godwinian
(11)	Kaya	Not viewed as a significant causal factor.	LDC must move away from AG and mining towards an industrial technology.	Need an industrial ec economy that is growing - Redistribution is important for economic development.	New type of international organization needed	Neo-Godwinian
(12)	Leontief	Not viewed as a significant factor.	The world is moving toward wide spread development of industrial technology.	World economic order must change with the LDCs growing faster than the DC.	Massive institutional change must take place in LDCs.	Neo-Godwinian
(13)	Modrzhinskaya	Rejects Neo-Malthusian	Capable of significantly resolving current problems.	End capitalism - encourage socialism.	Prosperity is limited by social structure-need re organization along socialist lives.	Marxist
(14)	Kosolapov	Not a significant factor.	Scientific technology essential for progress.	A world wide coordinated economy must result.	The world is moving toward communism for solution of problems.	Marxist
(15)	Tinbergen	A problem that cannot be reduced without economic development.	Technological development of Third World is essential - but should remain in larger intensive technology.	Labor intensive economy growing to meet needs - decline of growth in DCs.	Cooperative Global solutions more co-ordination between rich and poor nations.	Social Structuralist
(16)	Kahn/Brown/ Martel	Economy development need to slow growth.	Suggest that technology be transferred to poor countries.	Foster the growth of a world economy.	A global order should be established.	Neo-Godwinian

THEORIST	POPULATION	TECHNOLOGY	ECONOMY	SOCIAL ORGANIZATION	APPROACH
(17) Ophuls	The size and distribution of population along with present rates of increase make it an important in the dynamics of future problems.	Not a Panacea. Present industrial technology is maladapted to ecological scarcity.	Economic growth is becoming constrained by ecology. Laissez Faire capitalism will not be effective in situations of absolute scarcity.	Steady state societies and increased cooperation between DCs and LDCs is need to deal with current problems of growth	Social Structuralist
(18) Barney	If present trends in the growth and distribution of population continue by the year 2000 we may be within only a few generations of reaching the entire planets carring capacity.	Current technology may be poorly suited to the problems of countries with the largest populations.	GNP of the LDCs will grow faster than that of DCs. The GAP in quality of life will broaden because population growth in LDCs will consume the gains.	Not explicitly discussed	Neo-Malthusian
(19) Riker and Cecelski	A serious element in current situation, but the limits of population are well in the future.	No explicit position taken.	Economic growth is necessary to deal with future problems restricting growth may cause more serious problems than allowing it to continue.	The most serious problems we face are in the political and social barriers to solving the problems of growth.	Social Structuralist
(20) Brown	Population growth places serious pressure on the carring capacity of other biological systems needed for life-population growth must be slowed.	Technology must be redirected towards ound ecological principles. As it is used today it is wasteful and in the long run harmful.	Chance the economic relationship between LDC and DC - The LDC should intensify their economic relationships with each other and uncoople their economies from those of the DCs.	Reduction in scale of society towards better balance with the environment. Change in the economic relationships between nations.	Neo-Malthusian

Sources: Same Cole "Global Futures Debate 1965-1976" In Freeman and Jahoda - World Futures the Great Debate, Universe Books. N.Y. 1978. Many of the original works - see biblography for complete citations.

REFERENCES

Cited or Consulted

I. Adelman and C.T. Morris Economic Growth and Social Equity in Developing Countries Stanford, CA., Stanford University Press (1973)

D. Bell The Coming of Post Industiral Society London, Heinemann (1974)

Blueprint for Survival, The Ecologist Wadebridge, (January 1972)

L. Brown World Population Trends: Signs of Hope, Signs of Stress (Worldwatch Paper 8) Washington, D.C. Worldwatch Institute (1976)

L. Brown The Global Economic Prospects: New Sources of Economic Stress Worldwatch Institute, Washington (1978)

R. Dumont Utopia or Else...London, Deutsch (1974) New York, Universe Books (1975)

J.W. Forrester Population vs. Standard of Living -- The Trade-off that Nations Must Decide Euturist Vol. X, No. 5, October 1976.

R. Buckminister Fuller Utopia or Oblivion: the Prospect for Humanity Harmondsworth, Penguin Books (1972)

J. Galtung The Politics of Self-Reliance Oslo, University of Oslo (1976) Paper no. 44

J. Galtung Self-Reliance: Concepts, Theory and Rationale Oslo, University of Oslo (1977) Paper no. 35

R. L. Heilbroner An Inquiry into the Human Prospect New York Review of Books (24 January 1974) p. 21 and New York, Norton (1974)

A. Herrera et al. Catastrophe or New Society? Ottawa, I.D.R.C. (1976)

B. Johnston "Alternate Food" Agenda (May 1979) pp. 8-13

H. Kahn and A.J. Wiener The Year 2000 London, Macmillan (1967)

H. Kahn and B. Bruce-Briggs Things to Come New York, Macmillan (1972)

H. Kahn, W. Bronw and L. Martel The Next 200 Years New York, Morrow (1976)

Y. Kaya and Y. Suzuki Global Constraints and a New Vision for Development Technological Forecasting and Social Change (1974) Vol. 6, Nos. 3 and 4, p. 277 and 371

N. Keyfitz "Population Theory and Doctrine: A Historical Survey" in Wm. Petersen, Readings in Population Macmi-lan and Co., N.Y. (1972)

V. Kosolapov Mankind and the Year 2000 Moscow, Progress Publishers (1976)

W. Leontief et al. The Future of the World Economy Preliminary Report, New York, United Nations (1976)

D. Meadows et al. The Limits to Growth New York. Universe Books (1972) and Londan, Pan Books (1974)

M. Mesarovic and E. Pestel Mankind at the Turning Point New York, Dutton/Readers Digest Press (1974)

M. Mersarovic and E. Pestel Multilevel Computer Model of World Development System 6 vols. Laxenburg, Austria, International Institute for Applied Systems Analysis (I.I.A.S.A.)

Y. Modrzhinskaya and C. Stephanyan The Future of Society Moscow, Progress Publishers (1973)

W. Ophuls Ecology and Politics of Scarcity W.H. Freeman and Co. San Francisco (1977)

W. Petersen Population 3rd ed. Macmillan 1975

R.F. Ridker and E.W. Cecelski Resources, Environment and Population: The Nature of Future Limits. Population Reference Bureau Washington, 1979.

E.F. Schumacher Small is a Beautiful - A Study of Economics as if People Mattered London, Blond and Briggs (1973) New York, Harper & Row (1973)

E.F. Schumacher Economics should being with People not Goods Futurist Washington, D.C. (December 1974) P. 274

J. Spengler The Economist and the Population Question American Economic Review Providence, R.I. (March 1966) p. 1

R. Thomlinson Demographic Problems: Controversy Over Population Control Dickenson Publishing Company CA (1967)

J. Tinbergen Reshaping the International Order - A Report to the Club of Rome New York, Dutton (1976)

D. Wrong Population and Society 4th ED. Random House N.Y. 1977

Food

P. Abelson Food: Politics, Economics, Nutrition and Research Wasington, D.C., American Association for the Advancement of Science (1975)

S. Aziz (ed.) Hunger, Politics and Markets N.Y.U. Press (1975)

J. Bardach Harvest of the Sea London, Allen and Unwin (1969)

L. Brown By Bread Alone New York, Praeger (1974)

C. Clark Population Growth and Land Use New York, St. Martins Press (1967)

J. Dunman Agriculture: Capitalist and Socialist London, Lawrence and Wishart (1975)

N. Eberstadt Myths of the Food Crisis New York Review of Books New York (19 February 1976)

R.N.B. Kay Meat Production from Wild Herbivores Proceedings of the Nutirtion Society London (1970) Vol. 20, p.. 271

M. Lipton Why Poor People Stay Poor London, Temple Smith (1977)

F. Paukert Income Distribution at Different Levels of Development International Labour Review Geneva (1973)

P.R. Payne 'Are World Protein Supplies Adequate? Some Observations on the Use of Protein Foods in Nutrition' in J.W.G. Porter and B.A. Rolls (eds.) Protein in Human Nutrition London, Academic Press (1973)

N. Pirie (ed.) Food Protein Sources Cambridge, Cambridge University Press (1975) International Biological Programme 4

R. Revelle Resources Available for Agriculture Scientific American Vol. 235, no. 3 (September 1976) pp. 164-80

W. C. Robinson"Fertility Patterns and the Green Revolution' in T.T. Poleman and D. K. Freebairn (eds.) Food, Population and Employment: the Impact of the Green Revolution New York, Praeger (1973)

A. Simontov World Food Consumption Food Policy Vol. 1, no. 3 (1976)

R. Sinha Food and Poverty London, Croom Helm (1976)

J. Skinner the Springbok; a Farm Animal of the Future African Wildlife Natal, South Africa (1973) Vol. 26, no 3,

J.T. Worgan 'World Supplies of Protein from Unconventional Sources' in J.W. G. Porter and B.A. Rolls (eds.) Protein in Human Nutrition London, Academic Press (1973)

Energy

J.P. Albers et al Summary of Petroleum and Selected Mineral Statistics for 120 Countries Including Offshore Areas Washington, D.C., U.S. Government Printing Office (1973) U.S. Geological Survey professional paper 817.

P. S. Basile et al. Energy Demand Studies: Major Consuming Countries First Technical Report of the Workshop on Alternative Energy Strategies Cambridge, Mass., M.I.T. Press (1976)

I. C. Bupp and J. C. Derian The Economics of Nuclear Power Technoology Review Cambridge, Mass. (February 1975)

P. Chapman Fuel's Paradise Harmondsworth, Penguin (1976)

B. Commoner The Poverty of Power: Energy and the Economic Crisis New York, Knopf (1976)

G. Foley The Energy Question Harmondsworth, Penguin (1976)

D. S. Freeman et al. A Time to Choose: America's Energy Future Final Report by the Energy Policy Project of the Ford Foundation, Cambridge, Mass., Ballinger (1974)

J. D. Garnish Geothermal Energy as an Alternative Source Energy Policy Guildford (June 1976)

J. M. Hollander and M. K. Simmons Annual Review of Energy Palo Alto, Ca., Annual Review Inc. (1976)

J. H. Holloman et al Energy Research and Development Papers prepared for the Energy Policy Project of the Ford Foundation, Cambridge, Mass., Ballinger (1975)

O. Keck The Fast Breeder Reactor Programme in the Federal Republic of Germany D. Phil. thesis, Brighton, University of Sussex (1977)

M. Kenward Potential Energy: an Analysis of World Energy Technology London, Cambridge University Press (1976)

G. L. Kulcinski Fusion Power - an Assessment of its Potential Impact in the U.S.A. Energy Policy Guildford (June 1974)

A. B. Lovins Soft Energy Paths: Towards a Durable Peace Cambridge, Mass., Ballinger (1977)

A. B. Lovins and J. H. Price Non-Nuclear Futures: the Case for an Ethical Energy Strategy Cambridge, Mass., Ballinger (1975)

T. R. Malthus An Essay in the Principle of Population; and Summary View of the Principle of Population Harmondsworth, Pnguin (1970)

P. R. Odell Oil and World Power: Background to the Oil Crisis Harmondsworth, Penguin (1974)

O.E.C.D. Uranium: Resources, Production and Demand A Joint Report by the O.E.C.D. Nuclear Energy Agency and the International Atomic Energy Authority Paris, O.E.C.D. (1973b)

S. Wildhorn et al How to Save Gasoline: Public Policy Alternatives for the Automobile Cambridge, Mass., Ballinger (1975)

The following journals may be useful

Energy Policy

International Atomic Energy Agency Bulletin

Petroleum Economist

Petroleum Times

Technology Review

Non Fuel Mineral and Resources

H.E. Goeller and A.M. Weinberg the Age of Substitutability Science Washington, D.C. (20 February 1976)

M. H. Govett The Geographic Concentration of World Mineral Supplies Resources Policy Guildford (December 1975)

J. W. Lloyd Importance of Water Resources in the Development of the Chilean Copper Industry Institution of Mining and Metallurgy Bulletin and Transactions London (April 1974) p. A63-66 (Bulletin 809)

J. Mero Oceanic Mineral Resources Futures Guildford (December 1968) p. 125

W. D. Nordhaus Resources as a Constraint on Growth American Economic Review Providence, R.I. (May 1974)

Sir R. Prain Copper: The Anatomy of an Industry London, Mining Journal Books (1975)

World Bureau of Metal Statistics World Metal Statistics Birmingham, U.K., W.B.M.S. (monthly)

Technology

C.M. Cooper (ed.) Technology and Development Chichester, John Wiley (1978)

C. Freeman The Economics of Industrial Innovation Harmondsworth, Penguin (1974)

R. Gilpin Technology, Economic Growth and International Competitiveness Washington, D.C., Government Printing Office (1975)

R. Jungk Brighter than a Thousand Suns New York, Harcourt (1958)

G. Myrdal Economic Theory and Underdeveloped Regions London, Duckworth (1975)
National Resources Committee Technological Trends and National Policy including social implications of new inventions. Report of the Sub-Committee on Technology, Washington, D.C., Government Printing Office (1937)

I. Spiegel-Rosing and D. De Solla Price (eds.) Science, Technology and Soceity: A Cross Disciplinary Perspective London, Sage (1977)

A. C. Sutton Western Technology and Soviet Economic Developemnt: 1917 to 1930 Stanford, Ca., Stanford University, Hoover Institute on War, Revolution and Peace (1968)